Consumer and Corporate Affairs Canada | Consommation et Corporations Canada

(11) (A) No. 1 235 018

(45) ISSUED 880412

(52) CLASS 99-89
C.R. CL. 99-100

(51) INT. CL.[4] A22C 13/00,
A23B 4/04, A23C 19/14

(19) (CA) **CANADIAN PATENT** (12)

# (54) Smokeable, Thermoplastic Synthetic Casing, and a Process for Smoking the Foodstuffs Packed Therein When Heated or Encased Therein When Hot

(72) Erk, Gayyur;
Korlatzki, Rudi;
Jager, Herbert;
Lamessier, Wolfgang,
Germany (Federal Republic of)

(73) Granted to Naturin-Werk Becker & Co.
Germany (Federal Republic of)

(21) APPLICATION No. 459,874

(22) FILED 840727

(30) PRIORITY DATE Germany (Federal Republic of)
(P 33 27 175.5) 830728 Germany (Federal Republic of)
(P 34 26 723.9) 840720

No. OF CLAIMS 20 - NO DRAWING

Canada

DISTRIBUTED BY THE PATENT OFFICE, OTTAWA.
CCA-274 (11-82)

## ABSTRACT OF THE DISCLOSURE

The present invention provides a straight or curved, smokable thermoplastic synthetic casing for foodstuffs, particularly meat products such as cooked or boiled sausage, or cheese sausage which is heated after encasement, or encased when in the hot, molten state. The casing is of a thermoplastic synthetic material which, prior to saturation, can absorb at least 3%, preferably at least 5% of its weight of water. Furthermore, the present invention provides for the use of this casing for smoking the foodstuffs packed therein, as well as the smoked foodstuffs.

# A SMOKEABLE, THERMOPLASTIC SYNTHETIC CASING, AND A PROCESS FOR SMOKING THE FOODSTUFFS PACKED THEREIN WHEN HEATED OR ENCASED THEREIN WHEN HOT

The present invention relates to a smokeable, thermoplastic, synthetic casing in the form of a tubular film use for encasing foodstuffs, said foodstuffs being heated in this casing during the production process, or packed, which is to say encased, in this casing when in the hot, molten state. The present invention relates particularly to a casing for meat products such as boiled or cooked sausage, as well as for products of molten cheese (so-called cheese sausage) that are filled when hot. The present invention relates, in addition, to a smoking process for the foodstuffs packed in said casing, as well as the smoked foodstuffs. In addition to its amenability to smoking the synthetic casing according to the present invention is capable of weight retention to a very great extent, which is to say that even after protracted storage periods there is not noteworthy loss of weight. Furthermore, it is non-permeable to gases and resistant to fungi such as mildew. In addition to the foregoing, the casing according to the present invention surrounds the foodstuff packed therein smoothly and with no wrinkles.

In the case of foodstuffs that are subjected to heat treatment during the production process after encasement or packing, such as meat products, particularly boiled or cooked sausage, for which the heat treatment serves to cook the filling, and for foodstuffs, such as molten cheese products, that are packed into the casing when they are in the molten state, the smoking process is usually separate from the heat treatment (boiling or simmering). Thus, in the production of cooked sausage it is usual, once the sausages have been filled, to sweat these in moist air at 40 - 60°C, dry them at 60°C, process them with hot smoke at 68 - 74°C, cook them in a water-saturated atmosphere at 74°C, and finally cool them by spraying them with drinking water. When this is done, combined smoking and cooking chambers are generally used, the sausages being suspended in these. However, this process entails the disadvantage that it can only be used for sausages having casings that are of natural gut, or of collagens or cellulose regenerates, respectively, that are known to be well-suited to smoking. Casings of thermoplastic materials, such as the polyamide tube casings as in German Patent 28 50 182, which are to a great extent weight-retentive and impermeable to gas and steam, have up to the present always been regarded as impossible to smoke in principle (see, for example, G. Effenberg, Kunstdaerme, Alzey, 1976). This non-amenability to smoking is understandable in view of their low

permeability to gas and steam, and their associated non-permeability vis-a-vis smoke.

In order to permit exploitation of the characteristics of fresh woodsmoke, such as its positive effect on the flavour and the aroma of sausages, its preservative effects, and the improvement in the appearance brought about by the smoked colour, up the present the producer of sausage wares has been compelled to use natural gut or casings of collagens or cellulose regenerates, respectively. The advantage of the amenability of these products to smoking is, however, cancelled out by considerable disadvantages. These disadvantages are as follows: great weight losses occasioned by the great permeability of these casings to steam, limited stability of the product with regard to drying, superficial fat oxidation, and greying caused by microbial spoiling.

Since the synthetic sausage casings, which do not display these disadvantages, cannot be smoked by methods available up to the present, technically costly and non-cost effective methods have had to be used if a sausage that retains its weight and is only slightly vulnerable to spoiling, but which has a good smoked flavour, is to be produced.

Thus, smoked and cooked sausage wares in smokeable casings have been coated with steam-proof material once the smoking and cooking processes have been completed, this being done to reduce weight loss and prevent mildewing. However, when this was done, it was necessary to accept additional costs for the coating substance and the subsequent stages in the production process. In addition, the protection against oxidation that could be achieved in this manner was unsatisfactory. The opaque substance used for the coating made it impossible for the consumer to identify the contents of the sausage. Moreover, the suitability of the goods for immediate consumption was diminished. Another way to overcome the disadvantages described above was a second packing process in gas and steam impermeable synthetic pouches. This method, too, demands additional and costly stages in the production process, additional packaging materials, and costly packaging machinery.

A further unsatisfactory way of combining the smoked flavour of the sausage wares with weight-retentive, microbe resistant sausage casings is to do away completely with the use of casings that are smoke permeable and provide the smoked flavour by the addition of smoke concentrates or smoked additives to the sausage filling. Sausage treated in this manner is then packed in synthetic sausage casings that are not amenable to smoking, and then simply cooked.

However, this process entails the added disadvantage that no seperate skin forms on the surface of the sausage beneath the thermoplastic synthetic casing.

The prior art described indicates that up to now it has been impossible to produce a casing for the above described foodstuffs that are heated in the casing during the production process or packed when in the hot, molten state, such a casing being amenable to smoking, and at the same time weight-retentive and gas permeable, even though the requirement for such a casing is obvious. For this reason, the present invention undertakes to provide such a thermoplastic, synthetic casing which, on the one hand, is amenable to smoking, and on the other is impermeable to gas and steam. A further task of the present invention is the use of this casing in smoking foodstuffs packed in said casing and heated during the production process or packed into said casings when in a hot, molten state.

This task is solved by a casing that consists of at least one thermoplastic synthetic material and which, before becoming saturated, can absorb at least 3%, preferably 5%, of its own weight of water. The casing according to the present invention, which is amenable to smoking, can be either straight, or curved in the manner of garland (for packaging circular sausages).

The thermoplastic material for the casing can consist of one or a plurality of thermoplasts, i.e., polymer blends. It is preferable that the polymer material from which the casing is made, has a glass transition temperature $T_g$ which, depending on the moisture adsorption, can be lowered to at least $3^{\circ}C$, preferably to $-5^{\circ}C$, and particularly to $-20^{\circ}C$. Polymer mixtures (polymer blends) with other synthetic materials can also be used as material for the casings, only insofar as the resulting mixture has the same water absorption capability.

Especially preferred is a casing that is of an aliphatic polyamide with the above-described characteristics. Especially well-suited as polyamides are polycaprolactam, polyaminoenanthic acid amide, polyhexamethylene adipamide, polyhexamethylene sebacic acid amide, and mixtures of them or copolyamides of their monomer components. Of these, polycaprolactam, polyhexamethylene adipamide, mixtures of their polyamides and/or copolyamides of caprolactam, hexamethylene diamine and adipic acid are especially preferred.

Also suitable as casing materials are polymer blends of at least one aliphatic polyamide and other synthetic materials such as an ionomer resin, a modified ethylene-vinyl acetate copolymer and/or a modified polyolefin, as described in German patent 28 50 181.

In general, particular suitability as foodstuff casings or packing can be attributed to synthetic casings with the above described material characteristics, if they are used as single-layer films.

Single-layer thermoplastic synthetic films that are suitable as casings for foodstuffs that are to be smoked, as in the present invention, are the polycaprolactam, polyamino-enanthic acid amide, polyhexamethylene adipamide and/or polyhexamethylene sebacic acid amide films of the above-quoted German patent 28 50 182. These thermoplastic polyamide films are characterized in that at a very slight gas and steam permeability (see, for example, Table 1, Example 1, Column 2 and 3, p. 19), as stretched material that can be shrunk in and longitudinal and transverse direction they will surprisingly take up and pass sufficient smoke so as to result in a process product that is satisfying from the visual point of view, and with regards to flavour. The advantageous characteristics of polyamide casings according to German patent 28 50 182-- flexibility, softness to the touch, and freedom from wrinkles when in contact with the filling, even after cooling of the smoked product obtained

by combined steam and smoke treatment according to the present invention has been completed--make the use of casings of this kind particularly advantageous.

Shrinkable stretching means that the tubular film can be thermally fixed under controlled conditions subsequent to biaxial stretching such that casings ready for use will shrink from 2 to 30%, preferably from 5 to 20%, particularly from 10 and 15% at 80°C in water, so that during heating of the packed foodstuff the processing temperature that lies between 70 and 85°C will ensure that the shrinkage that ensures that the end product is free of wrinkles will be initiated. On the other hand, the controlled thermal fixing ensures that no noticeable additional shrinkage takes place at the normal transportation and storage temperatures of up to 40°C.

In regard to the plumpness and smoothness of the smoked end product that are especially desirable for cooked and boiled sausages, thermoplastic casings of synthetic material that display elastic behaviour are especially suitable. Elastic polyamide casings of polycaprolactam, polyhexamethylene adipamide, mixtures of these polyamides and/or polyamides of caprolactam, hexamethylene diamine and adipic acid, which can be used because of the soak water absorption capacity of at least 5%-wt, are obtainable in the following manner: single layer primary tubular films of the quoted polyamides are stretched with a longitudinal stretch

ratio of 1:2.3 to 1:4 and a transverse stretch ratio of 1:2.5 to 1:4.5 and subsequently fixed thermally with controlled multiaxial shrinkage. The polyamide tubular films treated in this way, which, because of their slight gas and water permeability (see, for example, Table 1, Example 2, Columns 2 and 3, p. 19) most surprisingly turn out to be sufficiently smoke permeable under the conditions of the smoking process as in the present invention, display the following elasticity characteristics:

At room temperature, when in a water-saturated state, at in internal pressure loading between 0 and 0.6 bar, they expand evenly and cylindrically according to the formula $\Delta D = m \cdot p+c$ internal pressure loading line (1) and on subsequent internal pressure relief between 0.6 and 0 bar according to the formula

$\Delta D' = -m' \cdot p+c$ internal pressure line (2)

they contract cylindrically, wherein:

$\Delta D$ Diameter expansion differential in (mm) under internal load;

$\Delta D'$ Diameter expansion differential in (mm) when internal pressure load is relieved;

m the slope of the internal pressure line (1);

m' the slope of the internal pressure line (2);

p internal pressure in (bar);

c the ordinate sector of the internal pressure

lines (1);

(c is always = 0)

c' the ordinate sector of the internal pressure lines (2)

and the following limiting conditions apply:

1. The absolute values for m and m' lie between 23 and 6, preferably between 20 and 8, especially between 17 and 11; for a given diameter, the absolute values for m and m' differ by no more than 20%, preferably by not more than 11%.

2. c' is always less than 4.5 mm, preferably less than 2.5 mm, and particularly less than 1.5 mm.

3. The equations (1) and (2) apply in the internal pressure range between 0 and 0.6 bar, or between 0.6 and 0 bar, respectively.

These elastic tubular films are described in greater detail in German disclosure 32 27 945.

With these special polyamide casings, which are sufficiently steam and smoke permeable, it is possible to produce smoked products whose wrinkle-free casings are characterized by excellent cutting and slicing properties

and spiral skinning properties, and whose surfaces display the matt appearance that is so desirable for high-quality sausage products.

A further object of the present invention is a process for smoking foodstuffs that are heated in their casings during the production process, or foodstuffs that are encased when in a hot and molten state, particularly meat products such as cooked and boiled sausage, which is characterized in that the foodstuff that is to be smoked is so smoked in a tubular casing that consists of at least one thermoplastic synthetic material which, up to the point that it is water saturated, can absorb at least 3%, preferably at least 5%, of its weight of water. The smoking can be effected according by various methods. The smoker temperature is between 20 and 100°C, temperatures between 50 and 90°C being preferred. The smoking process can be completed prior to, during or subsequent to the heat treatment. It is preferred that the smoke treatment be carried out in the presence of water or steam. During the simultaneous action of steam and smoke at temperatures between 60 and 100°C, preferably between 70 and 85°C, smoking and cooking take place simultaneously. The smoking can be accomplished with glow, vapour or friction smoke, or by means of liquid smoke concentrate (liquid smoke). In order to improve the formation of an independent skin beneath the casing, according to a preferred version of the

present invention the steam and smoke treatment is preceded by a dry-heat treatment at 50 - 100°C, preferably at 60 - 85°, and a cooling process consisting of spraying with cold drinking water and cooling at +4°C is carried out after the steam and smoke treatment. If liquid smoke concentrate is used, this is best applied at lower temperatures in the range of approximately 20 - 35°C by spraying, the heat treatment then being carried out at higher temperatures in the range of 60 - 90°C. The temperature during smoker and heat treatment is directed at the desired characteristics of the end product such as degree of cooking and the intensity of the smoke flavour. According to the intensity of the smoke addition, the thickness of the casing, and the flavour that the end product is to have, the addition of the smoke need by carried out, if necessary, only during a part of the steam treatment.

The smoker process can be carried out in commercially available combined smoking and cooking chambers that are familiar in and of themselves.

The advantages of the present invention lie in the preparation of a casing that is amenable to smoking, that retains the weight of the material that is encased even during longer storage periods, and is, in addition, resistant to microbes, such as mildew fungi that cause deterioration, and which encloses the encased material

without wrinkling, even after cooling. Furthermore, a significant advantage exists in the fact that toxic components of the natural smoke do not penetrate the casing during the smoking process, this being the case only for toxicologically insignificant components so that a product that is very pleasing with regard to flavour and appearance is obtained. The products that are obtained by using casings that are smoked according to the present invention, unlike the usual pale pink appearance of the products after cooking without smoking, are of a fine brown smoked appearance. A clearly visible individual skin with a typical golden-yellow smoked colour is formed on the meat product (sausage) beneath the casing. The typical smoked aroma and the unmistakable flavour of fresh smoke of sausages smoked in this way corresponds to the cooked sausages in conventional cases of natural materials or regenerated natural materials which are known to be amenable to smoking.

The following examples explain the invention:

Example 1:

Colourless, transparent, shrinkable, stretched sausage casings of caprolactam as described in German patent 28 50 182, (Example 1), having a diameter of 60 mm, were filled with meat sausage filling and portioned in a filling and cutting machine, in accordance with the Principles for Meat and Meat Products of the Deutsche Lebensmittel-

Kommission, 1975, Para. 2.222.1; this was done after the said casings had been soaked in cold water for 30 minutes. After the individual portions had been weighed they were processed as follows in a smoking and cooking chambr:

30 minutes heat treatment in dry air at 65°C

45 minutes cooking and simultaneous smoking with smoke saturated steam at 74°C

15 minutes spraying with cold water, cooling overnight in a cool room at +4°C

Assessment of sausage on next morning:

a. wrinkle-free, plump appearance

b. golden-yellow colour of the previously colourless skins, caused by taking on the colour of the smoke

c. clear formation of a secondary skin on the surface of the sausage

d. excellent flavour of the sausage, like natural smoke with typical smokey aroma

e. weight loss of sausage relative to filled weight, less than 0.2%.

Additional results are set out in Table 1.

Example 2:

Colourless, transparent biaxially stretched, elastic sausage casings of polyhexamethylene adipamide with a diameter of 85 mm were soaked for 15 minutes in warm water at 45 °C and

then filled with beer-ham filling until plump and portioned as in Example 1, using a filling and cutting machine. After the individual portions had been weighed these were further processed in a smoking and cooking chamber with a steam-smoke generator, as follows:

90 minutes cooking and simultaneous smoking with smoke saturated steam at 74°C

30 minutes spraying with cold water, cooling overnight in a cool room at +4°C

Next morning the sausages were assessed and displayed the same results as those described in Example 1 above.

Further results are set out in Table 1.

Example 3:

Colourless, transparent, shrinkable, stretched sausage casings of polycaprolactam as in German patent 28 50 182, Example 1, having a diameter of 60 mm, were soaked for 30 minutes in cold water and then filled with meat sausage filling as in Example 1 and portioned using a filling and cutting machine. After the individual sausages had been weighed they were further processed in a smoking and cooking chamber with a glow-type smoke generator, as follows:

30 minutes heat treatment in dry air at 65°C

60 minutes cooking and simultaneous smoking at 74°C and 100% relative humidity

15 minutes spraying with cold water, cooling overnight in a cool room at +4°C

Assessment on following morning:

The results correspond to those quoted in Example 1, apart from the fact that the smoke flavour and aroma is less marked that is the case with smoke generated by a steam smoke generator.

Comparative Example 1:

Uncoloured, commercial collagen sausage skins with a diameter of 60 mm were soaked for 10 minutes in a 5% aqueous cold solution of common salt and then filled with meat sausage filling, portioned, and weighed using a filling and cutting machine, as set out in the Principles for Meat and Meat Products of the Deutsche Lebensmittel-Kommission, 1975, Para. 2.222.1. Subsequently, they were processed in a smoking and cooking chamber with a steam smoke generator, as follows:

20 minutes heat treatment in dry air at 60°C

10 minutes smoking with smoke saturated steam at 65°C, 100% relative humidity

55 minutes cooking at 74°C, 100% relative humidity (without smoke)

15 minutes spraying with cold water

Cooling overnight in a cool room at +4°C

Assessment on following morning:
The results correspond to those set out in Example 1 and 2, apart from the stronger smoke colouration of the collagen casings, that tends to dark brown, more intensive formation of secondary skin, and a weight loss of more than 1.5% relative to the filled weight.
Further results are set out in Table 1.

Comparative Example 2:
Transparent, colourless, commercial sausage casings of polyethyleneterphthalate (PETP) with a diameter of 60 mm were filled with the same filling and further processes as in Example 1.
Assessment of the sausage on the next morning, however, gave no indication that these synthetic sausage casings were amenable to smoking:
a. no colouration of the casings caused by the smoke
b. no formation of secondary skin on the surface
c. no smoke flavour or aroma in the sausage
d. the casings appear wrinkled, even though the sausages suffer no measurable weight loss.
Further results are set out in Table 1.

Comparative Example 3:
Commercial, transparent, shrinkable, synthetic sausage casings of vinylide chloride copolymer (PVDC) with a

diameter of 60 mm were filled, smoked and cooked under the same conditions as described in Example 1.
The results are almost the same as those obtained in Comparative Example 2, with the difference that the PVDC casings were slightly pear-shaped, although in the main their surfaces were wrinkle-free.
Further results are set out in Table 1.

Comparative Example 4:

The Example 1, according to the present invention, was repeated, with the difference, that instead of smoke treatment, the recommended quantity of smoke concentrate was added to the filling, all other conditions being the same.

The sausages from Comparative Example 4, together with sausage from Example 1 were sampled by a tasting panel. The overwhelming majority of these tasters preferred the Example 1 sausage on account of the natural smokey flavour, the typical aroma of fresh smoke and, not least, because of the colouration of the sausage brought about by the effects of the smoke.

Table 1

Comparative Compilation of Test Results

| Examples | Water Permeability (1) | Oxygen Permeability (2) | Weight loss After 1 day %(3) | Weight loss After 4 days %(4) | Mildew Resistance (5) | Amenability to Smoking | Appearance after cooling |
|---|---|---|---|---|---|---|---|
| No.1 | 25 | 28 | 0.2 | 1.0 | Resistant | Good | Plump |
| No.2 | 22 | 26 | 0.2 | 1.0 | Resistant | Good | No wrinkles |
| Comp. 1 (Collagen cases) | 1 800 | 700 | 1.55 | 14.0 | Susceptible | V.Good | No wrinkles |
| Comp. 2 (PETP cases) | 11 | 70 | Not Measurable | 0.5 | Resistant | Not given | Wrinkled |
| Comp. 3 (PVDC cases) | 3 | 30 | Not Measurable | 0.2 | Resistant | Not given | No wrinkles |

(1) Steam permeability in $g/m^2 \cdot d$ at 20°C, 1 bar, and moisture gradient 85% against 0% relative humidity
(2) Oxygen permeability in $cm^3/m^2 \cdot d \cdot$ bar at 0°C and 75% relative humidity
(3) Weight loss after Day 1, relative to filled weight, by weighing sausages, average of 10 individual measurements
(4) Weight loss after 14 days storage in cool room at +4°C, relative to filled weight, average of 10 individual measurements
(5) Vulnerability to mildew Checked according to ASTM D 1924-63, uncompleted Agar Czapek-Dox as nutrient medium, unpurified samples, innoculated with a spore suspension in distilled water, at 29°C, 85% relative humidity

THE EMBODIMENTS OF THE INVENTION IN WHICH AN EXCLUSIVE PROPERTY OR PRIVILEGE IS CLAIMED ARE DEFINED AS FOLLOWS:

1. Straight or curved thermoplastic synthetic casings, amenable to smoking, for foodstuffs which, after being encased, are heated during the production process, or which are encased when in a hot, molten state, characterized in that the casings consist of at least one thermoplastic synthetic material that, up to the point of saturation, can absorb at least 3%, preferably at least 5% of its own weight of water.

2. A casing according to claim 1, characterized in that it consists of a synthetic material, the glass transition temperature $T_g$ of which can be lowered, depending on the moisture absorption, to at least 3°C, preferably to -5°C, and in particular to -20°C.

A

3. A casing according to ~~claim 1 or~~ claim 2, characterized in that it consists of polycaprolactam, polyaminoenanthic acid amide, polyhexamethylene adipamide, polyhexamethylene sebacic acid amide, mixtures of these, or copolyamides of their monomer components.

4. A casing according to claim 1, 2 or 3, characterized in that the thermoplastic synthetic asing of the foodstuffs to be smoked consist of polycaprolactam, polyhexamethylene adipamide, mixtures of these polyamides and/or copolyamides of caprolactam, hexamethylene diamine and adipic acid.

5. A casing according to claim 1 or claim 2, characterized in that it consists of

a) 50 - 99 parts-wt of at least one aliphatic polyamide and

b) 1 - 50 parts-wt of at least an ionomer resin, a modified ethylene vinyl acetate copolymer and/or a modified polyolefin.

6. A casing according to claim 1, characterized in that it consists of a single-layer film.

7. A casing according to claim 6, characterized in that it consists of a shrinkable, stretched tubular film.

8. A casing according to claim 6, characterized in that the thermoplastic synthetic casing of the foodstuff that is to be encased displays elastic behaviour.

9. A process for smoking foodstuffs that are heated in their casings during the production process or encased when in a hot and molten state, particularly meat products, characterized in that a casing as in claim 1 is used to encase the foodstuffs that are to be smoked.

10. A process according to claim 9, characterized in that the smoking process is carried out at temperatures from 20 - 100°C, preferably from 50 - 90°C.

11. A process according to claim 9, characterized in that the smoking is carried out in the presence of water or steam.

12. A process according to claim 11, characterized in that the combined effects of the steam and the smoke are effected at temperatures between 60 and 100°C, preferably between 70 and 85°C.

13. A process according to claim 11, characterized in that the addition of smoke is made only during a part of the steam treatment.

14. A process according to claim 11, characterized in that the simultaneous steam and smoke treatment is preceded by a dry-heat treatment at 50 to 100°C, preferably between 60 and 85°C, a cooling process, consisting of spraying with cold drinking water and cooling at +4°C following this steam and smoke treatment.

15. A process according to claim 9, characterized in that the smoking is carried out prior to, during or subsequent to the heat treatment.

16. A process according to claim 9 or claim 10, characterized in that the smoking can be carried out by glow, vapour, or friction smoke, or liquid smoke concentrate.

17. A process according to claim 15, characterized in that initial smoking is carried out at temperatures in the range of 20 to 35°C using liquid smoke concentrate (liquid smoke), the heat treatment then being carried out at higher temperatures in the range from 60 to 90°C.

18. A process according to claim 9 or 10, characterized in that the smoking is carried out in a smoking and cooking chamber that is familiar in and of itself.

19. Smoked foodstuffs, particularly meat products, produced according to one of the claims 9 to 11.

20. Cheese sausage, produced according to one of the claims 9 to 11.

23

*

# SUBSTITUTE

## *REMPLACEMENT*

## SECTION is not Present

## *Cette Section est Absente*